



# Arctic Collaborative Environment (ACE)

1 August 2012

*Enabling Cooperative Actions in the Arctic*

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# ACE JCTD: Overview

The ACE JCTD will provide a **web-based, open-access, Arctic-focused, environmental research and decision-support system** that integrates data from existing remote sensing assets and in situ observations to provide monitoring, analysis, and visualization based on earth observation data and modeling. The ACE JCTD will enable local, regional, and international cooperation and coordination on long-term environmental planning and near-term actions in response to climatic and environmental changes occurring in the Arctic Region.

## Partners

- OSD Oversight Executive: Elmer Roman
- COCOM Sponsors: USEUCOM and NORAD-USNORTHCOM
- Operational Managers: USEUCOM and NORAD-USNORTHCOM
- Technical Manager: NASA MSFC
- Transition Manager: Von Braun Center for Science & Innovation (VCSI)
- Other Partners: NOAA, NIC, USCG, Navy Task Force Climate Change, UAHuntsville, AMRDEC, DLR (German Space Agency), CRREL, ORNL, SAON, Norwegian Polar Institute, Russian Arctic and Antarctic Research Institute (AARI, through MOA with NOAA)

# Operational Problem Statement

There exists no Arctic awareness, decision-support system to enable long-term environmental planning, near-term cooperative actions, and real-time responses to humanitarian, environmental, and security issues in the Arctic

- No overarching operational architecture or universal core system for data & tool integration
- No common integrator of varied data sources
- Inadequate environmental visualization to support development of cooperative Arctic policies
- Inadequate access to models to support planning
- Insufficient integration of environmental data to support ongoing and future operations (e.g., SAR, Humanitarian Response, Environmental Response, Recovery Operations, Strategic Movement, Training)

The ACE JCTD will provide immediate capabilities and jump-start new solutions to common problems shared across the Arctic Community

# ACE JCTD: Capabilities

- **A monitoring, analysis, and visualization decision-support system** for environmental resource management, and humanitarian and hazard risk forecasting and management
  - Capitalize on existing space, air, ground-based, and NASA decision-support architecture & tools
  - Integrate & interoperate with existing & developing satellite imagery, in-situ, and disparate data sources
- **Enable and encourage data-sharing and product and model development** with Partner Nations and research organizations (e.g., Sustaining Arctic Observing Networks (SAON))
  - Integrate data in standardized data formats and taxonomy provided by partner nations and participating organizations
  - Management tools for decision making
- **An interdependent, regional, and national decision-support system**
  - Deliver land, sea, and atmospheric conditions measurement and monitoring capabilities (e.g., maritime route planning, water resources, pollution, sea-ice depth and flows)
  - Display and overlay multiple geospatial data information products (e.g., weather prediction, climate change, permafrost, land-cover mapping, and hydrography)

# User Requirements Working Group Members

- AMRDEC
- Bundeswehr Geoinformation Service
- CANEUS International
- Cold Regions Research & Engineering Lab
- District 17, USCG
- MDA Geospatial Services
- NASA Marshall Space Flight Center
- National Ice Center
- Naval Research Laboratory
- NOAA
- NORAD/USNORTHCOM
- University of Alabama in Huntsville
- USCG
- USEUCOM
- U.S. Department of Defense
- VCSI

# Key Data Requirements

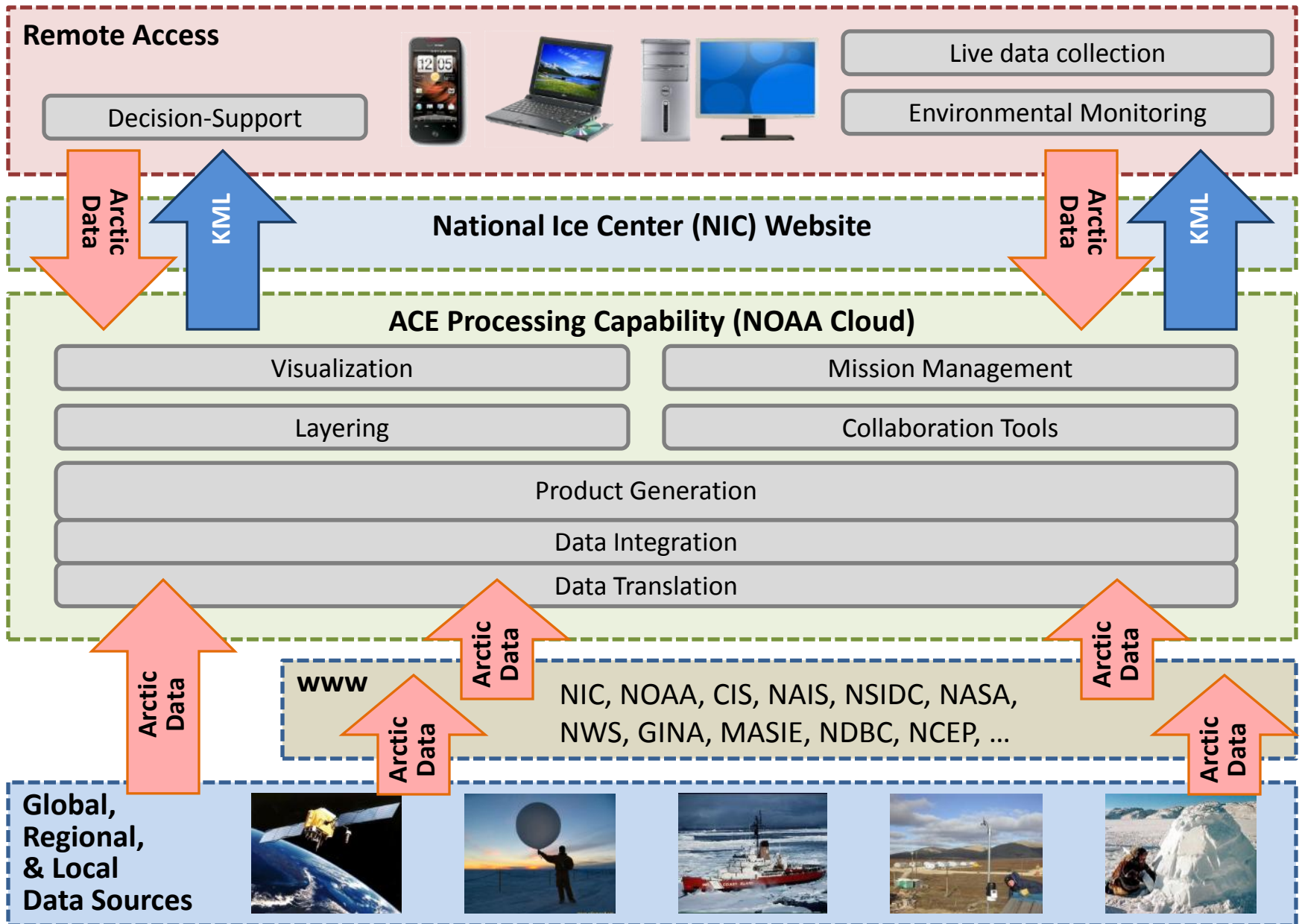
- Sea Ice
  - Location: Area, Onset, Growth, Drift, and Decay
  - Characterization: % Coverage, Thickness, and Type
- Sea Surface
  - Temperature
  - Movement: Sea State, Tides, Currents, and Swells
- Surface Weather
  - Visibility
  - Air Temperature
  - Winds: Speed, Direction, and Gusts
  - Relative Humidity & Dew Point
  - Forecast
- Icing
  - Propensity for Superstructure Icing
  - Propensity for Infrastructure Icing
- Snow cover
  - Depth
  - Drift
- AIS
  - Vessel Location
  - Vessel Characterization
- Special
  - Buoy data
  - Integrate active and passive data
- Other
  - Volcanic activity
  - Fires

# Data Flow & Product Generation: Current

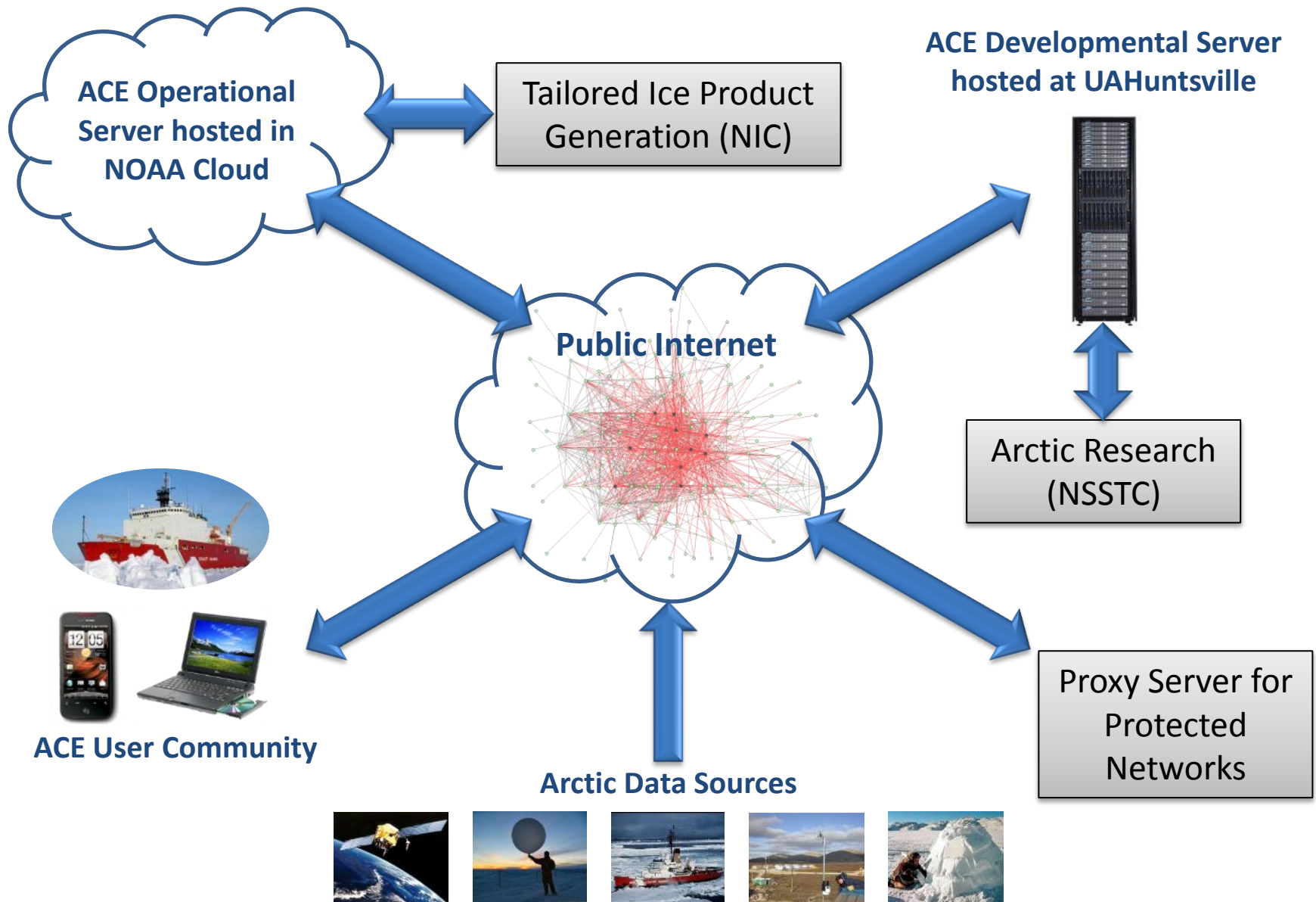




# Data Flow & Product Generation: ACE JCTD



# System View 1

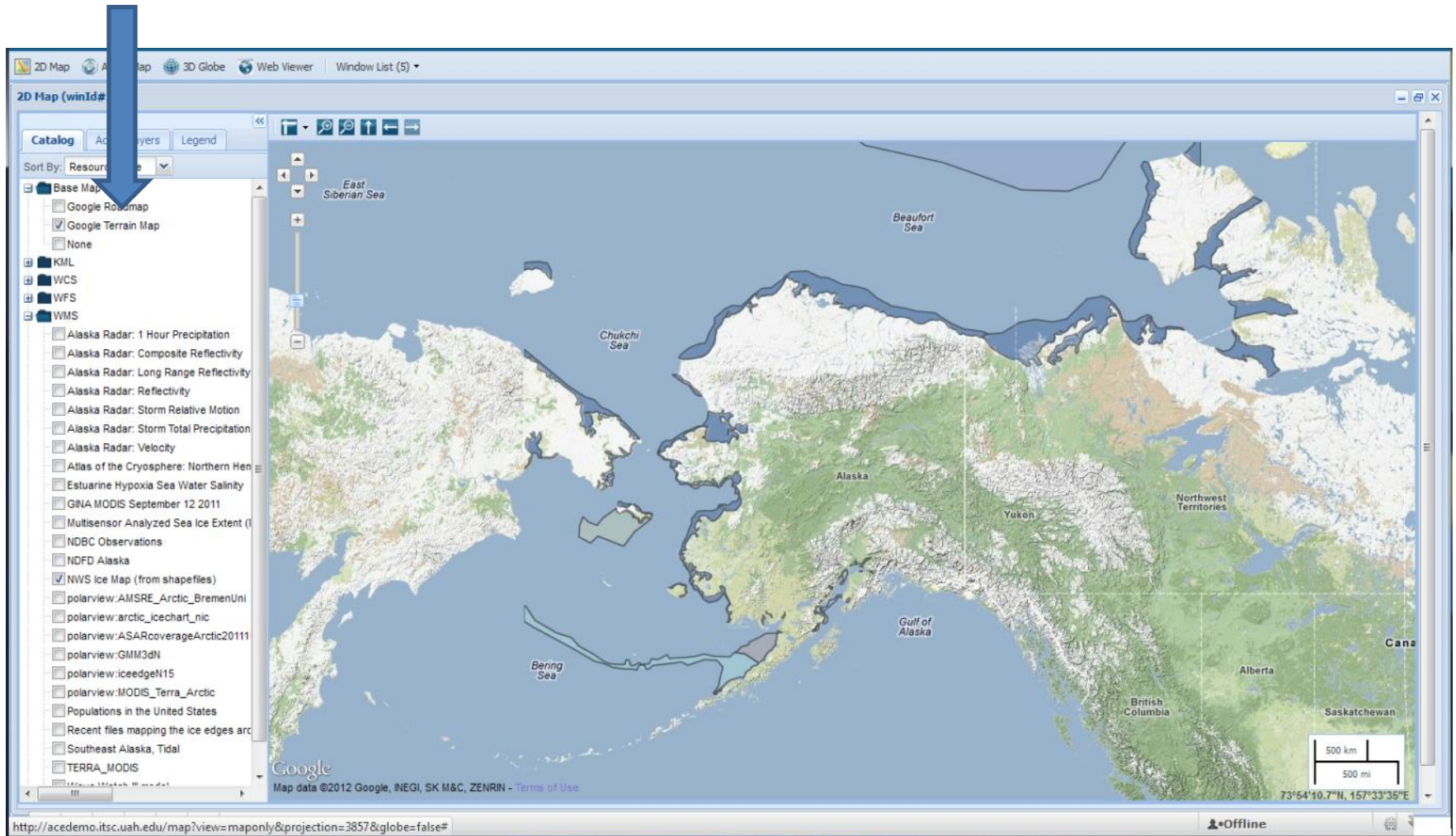


# ACE Beta Release

- Four views, with separate datasets for each:
  - 2D Map
  - 3D Map
  - Arctic Map
  - Web Page (to include webcams)
- Opacity for some layers
- Save and share map and data configurations
- Full set of collaborative tools
  - Cross-language chat
  - File Sharing
  - Common Operational Views
- Full Community Management

# 2D Map

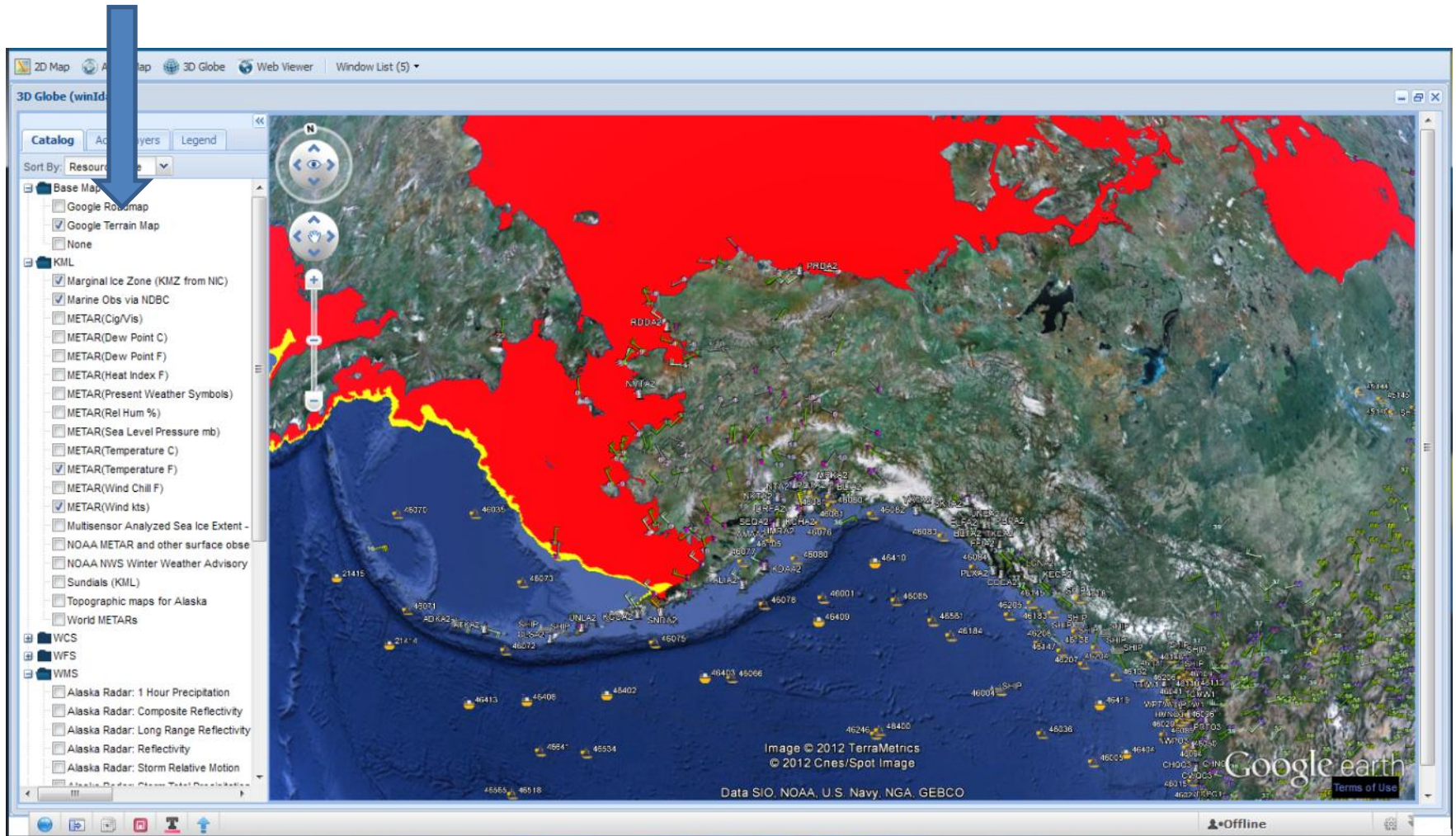
## National Weather Service Ice Map





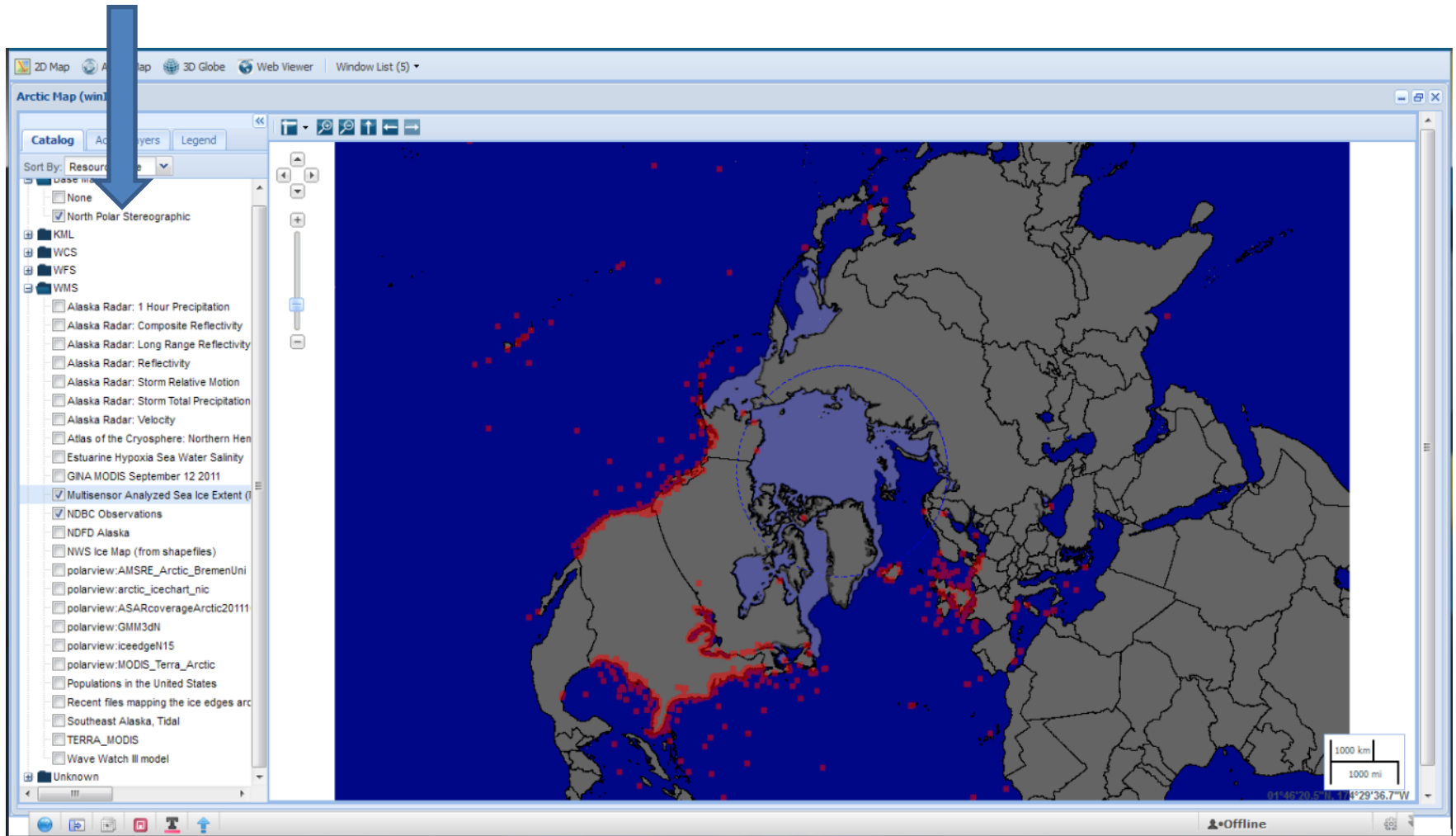
# 3D Globe

Surface Winds; Surface Temperature; National Data Buoy Center; and Marginal Ice Zone



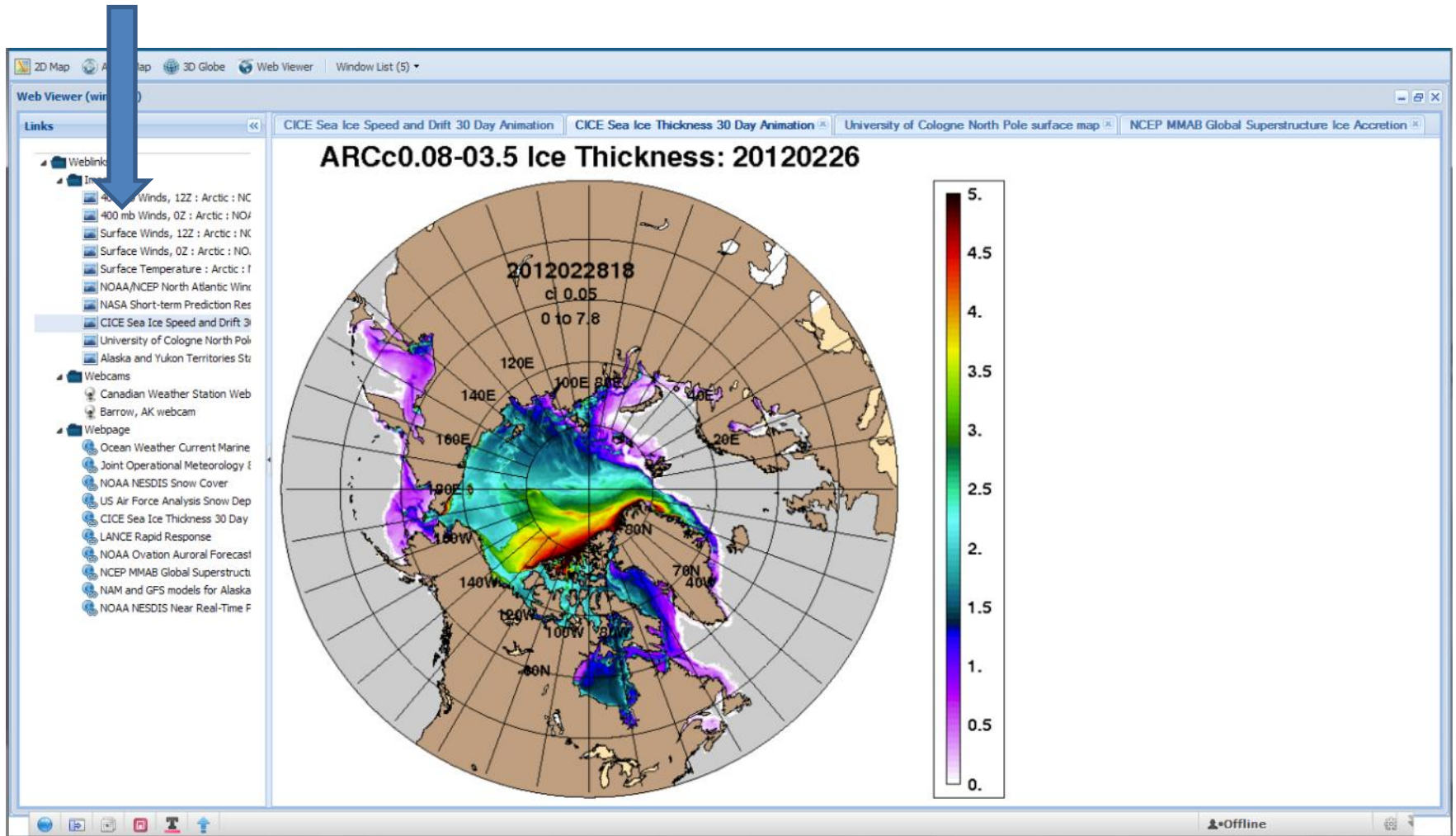
# Arctic Map

Multi-sensor Analyzed Sea Ice Extent; National Data Buoy Center



# Web Pages

Sea Ice Thickness (and three other tabs, each with separate data sets)



# ACE Partnerships

Office of the Deputy Assistant Secretary of Defense for Rapid Fielding (ODASD(RF))

- Program Sponsor and provides the Oversight Executive

U.S. European Command (USEUCOM)

- COCOM Sponsor, Operational Sponsor, and provides the Operational Manager

North American Aerospace Defense Command (NORAD) / U.S. Northern Command (USNORTHCOM)

- COCOM Co-Sponsor, Operational Co-Sponsor, and provides the Deputy Operational Manager

National Aeronautics and Space Administration (NASA) Marshall Space Flight Center (MSFC)

- Lead Technical Agent and provides the Technical Manager

Von Braun Center for Science & Innovation (VCSI)

- Lead Transition Agent and provides the Transition Manager

University of Alabama in Huntsville (UAHuntsville)

- Supports NASA MSFC as the lead for technical development, and will host the ACE Developmental Server upon completion of the JCTD

U. S. Army Aviation and Missile Research Development and Engineering Center (AMRDEC)

- Serves as the lead for ensuring the interoperability of the operational ACE system with existing Department of Defense (DoD) enterprise systems



# More ACE Partnerships

## National Ice Center (NIC)

- As a multi-agency operational center operated by the United States Navy (USN), the National Oceanic and Atmospheric Administration (NOAA), and the United States Coast Guard (USCG), the NIC will host the ACE capability through their website, and serve as the custodian for the ACE operational system

## Johns Hopkins University Applied Physics Lab (JHU-APL)

- Operational Test Agency (OTA) and will conduct the Utility Assessment (UA) as part of the Operational Demonstration (OD)

## NASA Goddard Space Flight Center (GSFC) NASA GSFC

- Provides Arctic Science expertise

## National Oceanic and Atmospheric Administration (NOAA)

- Provides national-level guidance and an interface to the Russian Arctic and Antarctic Research Institute (AARI).

## Sustaining Arctic Observing Networks (SAON)

- Provides an interface to the international Arctic community and the Arctic Council

## U.S. Army Cold Regions Research and Engineering Laboratory (CRREL)

- Supports both user requirements and ice product development

## German Aerospace Center (Deutsches Zentrum für Luft-und Raumfahrt) (DLR)

- Provides expertise in fusing buoy data

## Finnish Meteorological Institute (FMI)

- Provides access to Finnish-collected Arctic data and specialized meteorological products

## Canadian Embassy in DC

- Lead advocate for integrating ACE into Canadian Arctic capabilities

# Still More ACE Partnerships

## University of Maryland College Park (UMCP)

- Graduate student work will include integrating active and passive remote sensing data with high priority given to sea surface temperature; sea ice concentration; and sea ice type data sets and will continue to work on a superstructure icing model

## Aurora Research Institute (ARI)

- Students from ARI will create layers of past and present research licensing information for display in Google Earth and will link to the online ARI database of Northwest Territories license applications website

## University of Delaware (UD)

- Will contribute open-source, high-resolution (tens to hundreds of meters resolution) sea ice drift capabilities to the ACE catalog

## University of Alaska Fairbanks (UAF)

- Will engage Natural Resources Canada; the Russian Arctic and Antarctic Research Institute (AARI); and the International Arctic Research Center with the University of Illinois at Urbana-Champaign

# International Highlights

- Endorsed by the Sustaining Arctic Observing Networks (SAON) as a primary SAON task
- Formally endorsed by NOAA, with an agreement to integrate ACE capabilities into NOAA's developing Emergency Response Toolsets
- Secured archived Arctic sea-ice coverage data from Russia's Arctic and Antarctic Research Institute (AARI) covering 1933–1990

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